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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/476,684	12/30/1999	GOPAL AVINASH	GEMS:0074-15	8155
7590 04/20/2004 PATRICK S YODER 7915 FM 1960 WEST SUITE 330 HOUSTON, TX 77070			EXAMINER DASTOURI, MEHRDAD	
			ART UNIT 2623	PAPER NUMBER 10
DATE MAILED: 04/20/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/476,684

Applicant(s)

AVINASH, GOPAL

Examiner

Mehrdad Dastouri

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 January 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's petition filed February 9, 2004, has been entered and made of record.
2. Applicant's petition has been treated as a "request for reconsideration".

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

3. Applicant's response to Final Office Action filed February 9, 2004, has been entered and made of record. Applicant's arguments with respect to claims 1-39 have been considered but are moot in view of the new ground(s) of rejection.

### ***Specification***

4. The disclosure is objected to because of the following informalities:

In Page 18, Line 13, " $(1/1+p)$ " and " $(p/1+p)$ " should be respectively corrected to " $(1/(1+p))$ " and " $(p/(1+p))$ ".

In Page 19, Line 28, "weighting factor  $\alpha$ " should be corrected to "weighting factor  $\alpha$ ".

Appropriate correction is required.

### ***Drawings***

5. The drawings are objected to because of the following informalities:

Figure 3 indicates "Ms" as the input to the orientation smoothing depicted in Figure 9. However, Figure 9 does not illustrate "Ms" as an input. Verification and/or necessary corrections are required. It is also suggested to indicate the input 160 in Figure 9, is an operator input.

Figure 10 should be corrected to specify that after step 200 or 202, the routine of Figure 10 returns to step 168 of Figure 9.

Figure 12 should be corrected to identify the point that circuit 24 will advance to beyond step 208.

Figure 3 indicates "If" as the input to the homogenization smoothing depicted in Figure 13. However, Figure 13 does not illustrate "If" as an input. Verification and/or necessary corrections are required.

"In", "If" and "Ms" are respectively defined as the normalized image, the filtered image and structure mask in the specification. The abbreviations indicated in the drawings and the specification should be consistent (Particularly with regards to "In (structure)" and "In (non-structure)" depicted in Figures 9-13, and "If (structure)" and "If (non-structure)" depicted in Figures 14 and 15).

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 1, 2, 4-8, 22-24, 26-29, 30-33 and 35-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) in view of Noll et al (Homodyne Detection in Magnetic Resonance Imaging; IEEE Paper ISBN: 0278-0062).

Regarding Claim 1, Li et al disclose a method for enhancing a discrete pixel image, the method comprising the steps of:

(a) smoothing image data representative of pixels of a reconstructed image (Figures 1 and 2; Equations 1-12; Column 5, Lines 64-67, Column 5, Lines 1-47; Column 7, Lines 4-13);

(b) identifying structural features from the smoothed image data (Figures 1 and 2; Column 7, Lines 4-67, Column 8, Lines 1-57);

(c) orientation smoothing the structural features (Figures 1 and 2; Column 5, Lines 64-67, Column 5, Lines 1-47);

(d) homogenization smoothing non-structural regions (Figures 1 and 2; Column 6, Lines 12-47; Column 7, Lines 4-67, Column 8, Lines 1-57);

(e) orientation sharpening the structural features (Figure 4; Equations 13-21; Column 10, Lines 2-67, Column 11, Lines 1-50);

(f) blending the image data into data processed in accordance with the foregoing steps (Figure 5, Steps 510, 516 and 518; Figure 6; Column 11, Lines 66-67; Column 12, Lines 1-10).

Li et al do not explicitly disclose blending texture from the image data into the processed data.

Blending texture from the image data into the processed data is well known as taught by Noll et al based on homodyne detection in MRI (Teachings of IEEE Paper ISBN: 0278-0062 dated June 1991, Sections II and III, in particular "Partial k-Space).

Noll et al disclose blending texture from the image data into the processed data of the image in MRI reconstruction (Section III, APPLICATIONS).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al invention according to the teachings of Noll et al to blend texture from the image data into the data processed in accordance with the steps (a) through (e) because it will enhance MRI images and will reconstruct the image by including missing image information.

Regarding Claim 2, Li et al further disclose the method of Claim 1, wherein the structural features are determined based upon a scaled threshold value (Column 13, Lines 9-40; Column 15, Lines 34-40).

Regarding Claim 4, Li et al further disclose the method of Claim 1, wherein in step (b) the structural features include pixels having values below a first threshold value but above a second, lower threshold value, and positioned adjacent to a structural pixel (Column 15, Lines 34-40).

Regarding Claim 5, Li et al further disclose the method of Claim 1, wherein step (c) includes dominant orientation smoothing pixels based upon a dominant orientation and an orientation orthogonal to the dominant orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 6, Li et al further disclose the method of Claim 5, wherein dominant orientation smoothing is performed based upon a predetermined relationship between a characteristic of each structural pixel in the dominant orientation and in the orthogonal orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 7, Li et al further disclose the method of Claim 6, wherein the characteristic is a number of counts of orientations within a neighborhood of each structural pixel (Column 7, Lines 4-36).

Regarding Claim 8, Li et al further disclose the method of Claim 1, wherein step (e) is performed only for structural pixels having a value above a desired lower limit value (Column 14, Lines 10-43).

With regards to Claims 22 and 23, arguments analogous to those presented for Claims 1 and 5 are applicable to Claims 22 and 23.

With regards to Claim 24, arguments analogous to those presented for Claim 2 are applicable to Claim 24.

With regards to Claim 26, arguments analogous to those presented for Claim 4 are applicable to Claim 26.

With regards to Claim 27, arguments analogous to those presented for Claim 6 are applicable to Claim 27.

With regards to Claim 28, arguments analogous to those presented for Claim 7 are applicable to Claim 28.

Regarding Claim 29, Li et al further disclose the method of Claim 1, wherein step (d) is performed only for structural pixels having a value above a desired lower limit value (Column 13, Lines 33-54).

With regards to Claims 30-32, arguments analogous to those presented for Claim 1 are applicable to Claims 30-32. Li et al further disclose the image acquisition system includes a magnetic resonance scanner (Figure 1; Column 5, Lines 10-47).

With regards to Claim 33, arguments analogous to those presented for Claim 2 are applicable to Claim 33.

With regards to Claim 35, arguments analogous to those presented for Claim 4 are applicable to Claim 35.

With regards to Claim 36, arguments analogous to those presented for Claim 5 are applicable to Claim 36.

With regards to Claim 37, arguments analogous to those presented for Claim 6 are applicable to Claim 37.

With regards to Claim 38, arguments analogous to those presented for Claim 7 are applicable to Claim 38.

With regards to Claim 39, arguments analogous to those presented for Claim 8 are applicable to Claim 39.

8. Claims 3, 9-21, 25 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) further in view of Noll et al (Homodyne Detection in Magnetic Resonance Imaging; IEEE Paper ISBN: 0278-0062) and Felmlee et al (U.S. 5,900,732).



Regarding Claim 3, Li et al disclose the method of Claim 2, wherein the scaled threshold value is computed based upon an initial threshold value (Column 13, Lines 9-40; Column 14, Lines 10-43; Column 15, Lines 34-40. Threshold function with lower cut off side value  $0.9r$  and higher cut off value  $1r$ ).

Li et al and Noll et al do not explicitly disclose the scaling factor is input by a user.

Felmlee et al disclose a system of reconstructing MR images comprising manually setting thresholds and scale factors (Column 4, Lines 5-9).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al and Noll et al combination according to the teachings of Felmlee et al to apply a scaled threshold value input by a user because it will increase system flexibility and will result in enhancing extraction of the structural features.

With regards to Claims 9 and 10, arguments analogous to those presented for Claims 1-3 are applicable to Claims 9 and 10.

With regards to Claim 11, arguments analogous to those presented for Claim 4 are applicable to Claim 11.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

With regards to Claim 13, arguments analogous to those presented for Claim 6 are applicable to Claim 13.

With regards to Claim 14, arguments analogous to those presented for Claim 7 are applicable to Claim 14.

With regards to Claim 15, arguments analogous to those presented for Claim 8 are applicable to Claim 15.

With regards to Claims 16 and 17, arguments analogous to those presented for Claims 1-4 are applicable to Claims 16 and 17.

With regards to Claim 18, arguments analogous to those presented for Claim 5 are applicable to Claim 18.

With regards to Claim 19, arguments analogous to those presented for Claim 6 are applicable to Claim 19.

With regards to Claim 20, arguments analogous to those presented for Claim 7 are applicable to Claim 20.

With regards to Claim 21, arguments analogous to those presented for Claim 8 are applicable to Claim 21.

With regards to Claims 25 and 34, arguments analogous to those presented for Claim 3 are applicable to Claim 25 and 34.

***Contact Information***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**MEHRDAD DASTOURI**  
**PRIMARY EXAMINER**



Mehrdad Dastouri  
Primary Examiner  
Group Art Unit 2623  
April 15, 2004